

CLAIMS

- Sub C1*
1. (Amended) A composite reverse osmosis membrane comprising:
a porous support; and
a polyamide skin layer formed on the porous support,
wherein the contact angle between the polyamide skin layer surface and
water is no more than 45°, the salt rejection is at least 98%, and the permeate
flow rate is at least $0.5\text{m}^3/\text{m}^2\cdot\text{day}$ when evaluated by using feed water which
has pH 6.5, 0.05 weight % of salt, an operation pressure of 5kgf/cm^2 and a
temperature of 25°C.
2. The composite reverse osmosis membrane according to claim 1, wherein
the contact angle is no more than 40°.
3. The composite reverse osmosis membrane according to claim 1, wherein
the polyamide skin layer is formed by reacting a compound having at least
two reactive amino groups and a polyfunctional acid halide compound having
at least two reactive acid halide groups.
4. (Cancelled)
- Sub C2*
5. The composite reverse osmosis membrane according to claim 1, wherein
the salt rejection is at least 98% and the water permeability is at least
 $0.6\text{m}^3/\text{m}^2\cdot\text{day}$ when evaluated by using feed water which has pH 6.5, 0.05
weight % of salt, an operation pressure of 5kgf/cm^2 and a temperature of 25°C.
6. A method of producing a composite reverse osmosis membrane comprising
the steps of:
forming a layer by coating on a porous support a solution A comprising
a compound having at least two reactive amino groups;
contacting the layer with a solution B comprising a polyfunctional
acid halide compound; and
subsequently contacting the layer with a solution C comprising a
polyfunctional acid halide compound of a higher concentration than the
solution B in order to form a polyamide skin layer.

7. The method according to claim 6, wherein the solution C contains the polyfunctional acid halide compound at least 1.2 times in concentration of the solution B.
8. The method according to claim 6, wherein the solution C contains the polyfunctional acid halide compound ranging from 1.3 to 5000 times in concentration of the solution B.
9. The method according to claim 6, wherein the solution B partially remains unreacted at a contact with the solution C.
10. The method according to claim 6, wherein the compound in the solution A comprises at least two reactive amino groups, and the compound is at least one selected from the group consisting of aromatic polyfunctional amine, aliphatic polyfunctional amine and alicyclic polyfunctional amine.
11. The method according to claim 10, wherein the aromatic polyfunctional amine is at least one selected from the group consisting of m-phenylenediamine, p-phenylenediamine, 1,3,5-triaminobenzene, 1,2,4,-triaminobenzene, 3,5-diamino benzoic acid, 2,4-diaminotoluene, 2,4-diaminoanisole, amidol, and xylenediamine; the aliphatic polyfunctional amine is at least one selected from the group consisting of ethylenediamine, propylenediamine and tris(2-aminoethyl)amine; and the alicyclic polyfunctional amine is at least one selected from the group consisting of 1,3-diaminocyclohexane, 1,2-diaminocyclohexane, 1,4-diaminocyclohexane, piperazine, 2,5-dimethylpiperazine and 4-aminomethylpiperazine.
12. The method according to claim 6, wherein the polyfunctional acid halide compound contained in the solution B and solution C is at least one selected from the group consisting of aromatic polyfunctional acid halide compound, aliphatic polyfunctional acid halide compound, and alicyclic polyfunctional acid halide compound.
13. The method according to claim 12, wherein the aromatic polyfunctional acid halide compound is at least one selected from the group consisting of

trimesic acid chloride, terephthalic acid chloride, isophthalic acid chloride, biphenyldicarboxylic acid chloride, naphthalenedicarboxylic acid dichloride, benzene trisulfonic acid chloride, benzene disulfonic acid chloride, and chlorosulfonium benzene dicarboxylic acid chloride; the aliphatic polyfunctional acid halide compound is at least one selected from the group consisting of propanetricarboxylic acid chloride, butanetricarboxylic acid chloride, pentanetricarboxylic acid chloride, glutaryl halide, and adipoyl halide; and the alicyclic polyfunctional acid halide compound is at least one selected from the group consisting of cyclopropanetricarboxylic acid chloride, cyclobutanetetracarboxylic acid chloride, cyclopentanetricarboxylic acid chloride, cyclopentanetetracarboxylic acid chloride, cyclohexanetricarboxylic acid chloride, tetrahydrofurantetracarboxylic acid chloride, cyclopentanedicarboxylic acid chloride, cyclobutanedicarboxylic acid chloride, cyclohexanedicarboxylic acid chloride, and tetrahydrofurandicarboxylic acid chloride.

14. The method according to claim 6, wherein the polyfunctional acid halide compound contained in at least either the solution B or solution C has a hydrophilic group.

15. The method according to claim 14, wherein the hydrophilic group is at least one selected from the group consisting of $-\text{COOX}$, $-\text{OH}$, $-\text{SO}_3\text{X}$, $-\text{OSO}_3\text{X}$, $-\text{NH}_2$, $-\text{NR}_3\text{Y}$ and $-(\text{OCH}_2\text{CH}_2)-$, where X indicates a hydrogen atom, an alkaline metal or $-\text{NH}_4$, R indicates a hydrogen atom or an alkyl group, and Y indicates a halogen.

16. The method according to claim 6, wherein the porous support is further contacted with at least one aqueous solution, comprising either an acidic aqueous solution or an alkaline aqueous solution after the contact with the solution C.

17. The method according to claim 16, wherein the pH of the acidic aqueous solution ranges from 1 to 5 while the pH of the alkaline aqueous solution ranges from 8 to 13.

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